REMARKS

The amendments and remarks presented herein are believed to be fully responsive to the Office Action.

Summary of Examiner Interview: Attorney (Changhoon Lee) for the Applicant would like to thank Examiner Crawford for the helpfulness and courtesy shown in the telephonic interview with Examiner on August 31, 2010. As Attorney discussed with Examiner at the interview, Applicant respectfully amends the independent claim 11 as recited above. The Attorney presented, and the Examiner agreed that the present invention as amended herein is distinguishable over the cited references.

STATUS OF THE CLAIMS

Claims 11-13, 15 and 17-23 are pending. Claims 1-10 were previously withdrawn from further consideration, as being drawn to a provisionally non-elected invention. Claim 13 has been cancelled and claim 11 has been amended. No new matter has been added. The independent claim recited by the present application is claims 11.

CLAIM REJECTIONS UNDER 35 U.S.C. §§ 102. 103

Claims 11, 12, 15 and 17-23 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Publication No. 2003/0020085 to Bour et al. ("Bour"). Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Bour in view of U.S. Publication No. 2003/0209704 to Yamada ("Yamada").

Summary of The Present Application

Before addressing the prior art, it may be helpful to elaborate on certain features of the present invention. In this way when comparing the claim language to the prior art, one can more readily perceive the deficiencies of the prior art when compared to the invention as defined in the claims. The claimed invention is directed to a high efficiency nitride semiconductor light emitting device **for emitting ultraviolet light using an In-rich InGaN quantum well layer**. A Ga-rich InGaN quantum well layer comprising 10% or less of InN is mainly used to form a UV light source using nitride semiconductors. It is known that as the light emission wavelength is reduced, the light emission efficiency is lowered. In case of a UV light source, the InN composition in the InGaN quantum well layer is smaller than that in the visible light source and thus the light emission efficiency is lowered because the local carrier energy level is rarely formed.

<u>The Cited Bour Reference</u>

Bour discloses an indium mole fraction of a quantum well layer is graded linearly, and that other functional forms for indium mole fraction in one or more of the quantum well layers in active region may be used. Bour describes that alternate grading of the indium mole fraction decreases or increases monotonically across a quantum well, the mole fraction of indium may instead have a global maximum and/or one or more local maximum at one or more intermediate positions in the quantum well layer.

However, Bour does not disclose the light emitting device for emitting ultraviolet light. In fact, Bour teaches away from the light emitting device for emitting ultraviolet light.

As to the wavelength of the light source, Bour expressly points out that:

> [0035] ... In addition, the emission wavelength of light emitting devices in accordance with the present invention does not substantially blue shift[1] as the carrier density in the quantum well layer is increased.

Independent claim 11 is directed to a light emitting device for emitting ultraviolet light and has been amended to now recite an In-rich InGaN quantum well layer where the In-rich region is formed of $In_xGa_{1-x}N$, where x in the In-rich region of the quantum well layer is greater than 0.5 and less than or equal to 0.8. Claim 1 further amended to recite that the light emitting device is **configured to emit ultraviolet light using said In-rich InGaN quantum well layer**. In contrast, Bour merely describes that the mole fraction of indium in a graded $In_xGa_{1-x}N$ quantum well is from about 0 to about 0.5.

Examiner admits that Bour fails to teach the mole fraction of indium in the In-rich region of the quantum well layer being within a range of 0.5-0.8. Nevertheless, Examiner contends that the claimed ranges of the mole fraction of indium in the In-rich region of the quantum well layer overlap or lie inside ranges disclosed by Bour.

However, the range ($0.5 < x \leq 0.8$) of the amended claim does not overlap or lie inside the ranges (about $0 < x \leq$ about 0.5) disclosed by Bour. In fact, Bour teaches away from the claimed In-rich InGaN quantum well layer. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366. Bour actually encourages one of skill in the art to use **Ga-rich InGaN quantum well layer, instead of In-rich InGaN quantum well layer.** Bour suggests that the mole fraction of indium in a graded $In_xGa_{1-x}N$ quantum well is from about 0 to about 0.5. The mole fraction of indium in such a graded quantum well may be greater than zero at both of the quantum well's interferences with barrier layers. Thus, Bour discloses that the mole fraction of indium is **always**

[1] A decrease in wavelength is called blue shift.

equal to or less than 50%. In contrast, the claimed invention comprises the **In-rich InGaN quantum well layer** where the mole fraction of the indium in the In-rich region is always **greater than 50%.** Thus, while Bour discloses the mole fraction of the indium close to 50%, at the same time it provides the motivation for one of ordinary skill in the art to focus on the mole fraction levels less than 50% and to explore mole fraction levels below the claimed ranges. The statement in Bour would discourage one of skill in the art from using **In-rich InGaN quantum well layer** having a mole fraction of the indium over 50%. See MPEP 2144.05.

The Cited Yamada Reference

Examiner cited Yamada against the limitations of claim 13. Yamada discloses a light emitting device including an active layer depositing at least two kinds of well layers emitting different colors of light and mixing colors thereby emitting light of another color such as white with a desired color rendering property. However, just like Bour, Yamada does not disclose the light emitting device having an In-rich InGaN quantum well layer for emitting ultraviolet light. In fact, Yamada teaches away from the light emitting device for emitting ultraviolet light. For example, Yamada discloses a first well layer of $In_{0.5}Ga_{0.5}N$ 108 and a second well layer of $In_{0.8}Ga_{0.2}N$. See Fig. 1 and para. [0075] and [0077] of Yamada. The second well layer is formed to emit light having the main wavelength longer than that emitted by the first well layer. See para. [0083] of Yamada. However, the light emitted by the first and second well layers is observed to have main wavelength of about 470nm (blue) and 575 nm (yellow), respectively. See para. [00870]. As explained above, a Ga-rich InGaN quantum well layer comprising 10% or less of InN is mainly used to form a UV light source using nitride semiconductors. Yamada fails to

teach use of the In-rich region of $In_xGa_{1-x}N$ ($0.5 \leq x \leq 0.8$) for a quantum well layer emitting UV light.

Finally, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references. This motivation-suggestion-teaching test informs the *Graham* analysis. "To reach a non-hindsight driven conclusion as to whether a person having ordinary skill in the art at the time of the invention would have viewed the subject matter as a whole to have been obvious in view of multiple references," there must be "some rationale, articulation, or reasoned basis to explain why the conclusion of obviousness is correct." *In re Kahn*, 441 F.3d 977, 986 (Fed. Cir. 2006). The *KSR* decision by the Supreme Court has not eliminated the motivation-suggestion-teaching test to determine whether prior art references have been properly combined. Rather, in addition to the motivation-suggestion-teaching test, the Court discussed that combinations of known technology that are "expected" may not be patentable. No such motivation or suggestion is present in the prior art.

Therefore, no *Prima Facie* case of obviousness exists under the *Graham v. John Deere* and *KSR v. Teleflex* standards because combination of Bour and Yamada fails to teach every limitation of claim 11. More specifically, Bour does not disclose the claimed light emitting device configured to emit ultraviolet light by using a single In-rich InGaN quantum well layer, and Yamada still fails to remedy the deficiencies of Bour in reaching all the elements and limitations of the claims of the present invention. Neither Bour nor Yamada nor combination thereof teaches or suggests all the limitations of the claimed invention. Accordingly, claim 11 of the present invention is in condition for allowance.

The Examiner rejected claims 12, 15 and 17-23 which depend from claim 11 as being unpatentable over Bour. Thus, the above remarks for claim 11 are equally applicable to the dependent claims 12, 15 and 17-23.

As to claims 12 and 23, Examiner states that the claimed ranges are *prima facie* obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. Again, the claimed invention achieves unexpected results for the light emitting device **configured to emit ultraviolet light by using a single In-rich InGaN quantum well layer having the In-rich region of $In_xGa_{1-x}N$** (x= 0.6 or 0.7, respectively).

Accordingly, claims 12, 15 and 17-23 of the present invention are also in condition for allowance.

If any issue regarding the allowability of any of the pending claims in the present application could be readily resolved, or if other action could be taken to further advance this application such as an Examiner's amendment, or if the Examiner should have any questions regarding the present amendment, it is respectfully requested that the Examiner please telephone Applicant's undersigned attorney in this regard.

Respectfully submitted,

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